Climate Change and Waste Management

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Randy Freed, ICF Kaiser

(contractor to USEPA, Office of Solid Waste)

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Overview

- SW Management and Climate Change -- making the link
- Research Results and Tools
- EPA/OSW Program Applications

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Making the link:
What is Climate Change?

- **Climate Change:** "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." United Nations Framework Convention on Climate Change (UNFCCC)

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Making the link:
Evidence and Greenhouse Gases

- **Evidence:** "the balance of evidence suggests that there is a discernable human influence on global climate." Intergovernmental Panel on Climate Change (IPCC)
- **6 GHGs covered by inventories -** CO_2, CH_4, N_2O, PFCs, HFCs, SF_6

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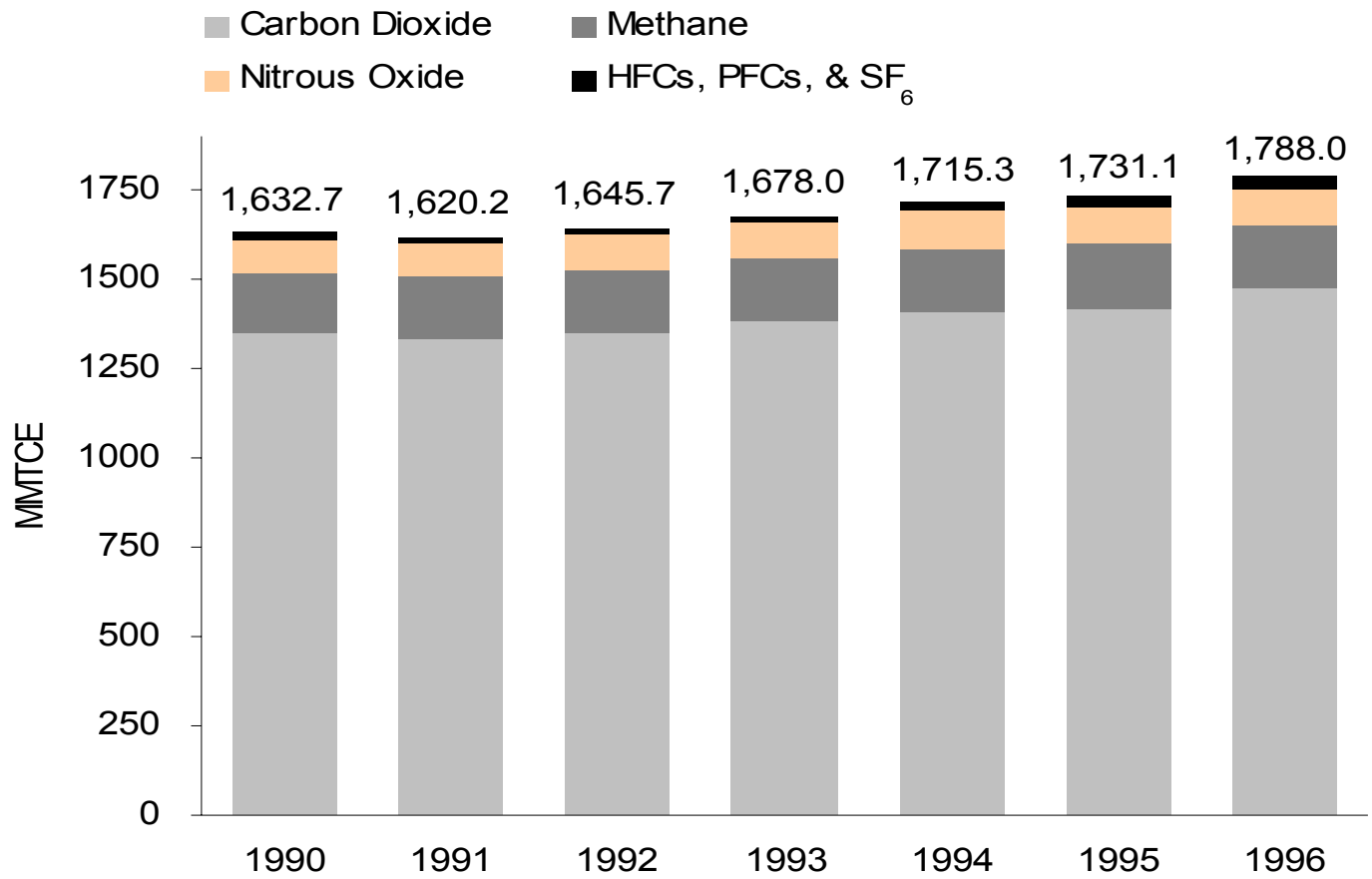
Making the link:
U.S. GHG Emissions



Making the link:
U.S. Methane Emissions, 1997

- Landfills - 36%
- Enteric Fermentation - 19%
- Natural Gas Systems - 19%
- Coal Mining - 11%
- Manure Management - 9%
- Others - 5%

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Making the link:
CCAP Goals

- Energy use, forest carbon (paper and wood)
- US Climate Change Action Plan
  - Over 50 voluntary initiatives
  - Source Reduction and Recycling initiative targets 5 MMTCE in GHG reductions by 2000

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Research:
Goals

- Measure GHG reduction potential for various waste management options
- Help evaluate effectiveness of EPA SR&R initiatives
- Provide tools for policymakers and businesses to plan GHG reduction actions
- Develop emission factors to support GHG voluntary reporting activities

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Research:
Scope

- **Materials**
  - Major components of MSW -- paper (office, news, corrugated, mixed), aluminum cans, steel cans, plastics (HDPE, LDPE, PET), yard trimmings, food scraps, glass
- **Waste management strategies**:
  - Source reduction, recycling, composting, combustion, landfilling

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Research:
Methodology

- Streamlined Life Cycle Analysis — only GHG emissions and sinks:
  - Process and transportation in raw material acquisition and manufacturing stages
  - Forest carbon storage (paper and wood)
  - Soil carbon storage when composting
  - Non-biomass GHG emissions from waste combustors
  - Decomposition and carbon storage in landfills

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Research:

Tallying GHG Emissions And Sinks From Source Reduction

- No process or transportation emissions from materials acquisition or manufacturing
- Increase in forest carbon storage for paper products
- No emissions from waste management

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Research:

Tallying GHG Emissions And Sinks From Recycling

- Generally lower emissions in manufacturing with recycled feedstocks
- Increase in forest carbon storage with paper products
- Some emissions from collection and processing of recyclables
- No emissions from waste disposal

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Research:
Tallying GHG Emissions And Sinks From Combustion

- CO_2 and N_2O emissions from non-biogenic sources (e.g., plastics)
- GHG reductions from energy recovery (displaced electric utility fossil fuels)

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Research:

Tallying GHG Emissions And Sinks From Landfilling

- Methane emissions
- GHG reductions from gas collection
- GHG reductions from energy recovery
- Carbon storage from undecomposed biogenic carbon

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Research:
Results

- Results expressed as emission factors -- Metric tons C per ton of material managed
- Used to compare base case with alternative case

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Research:
Results

- Example application:
  - Evaluate GHG effect of recycling 10 tons of office paper. Baseline practice is landfilling.
    - Baseline: 10 tons x 1.05MTCE/ton=10.5 MTCE
    - Alternative: 10 tons x -0.82 MTCE/ton = -8.2 MTCE
    - Net change: -8.2 MTCE - (10.5 MTCE) = -18.7 MTCE

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Research:
Products

- Report
- WAste Reduction Model (WARM)
- Energy Policy Act 1605(b) voluntary GHG reporting guidance

Research:

Tools -- WARM

WAste Reduction Model (WARM) -- Inputs

Use this worksheet to describe the baseline and alternative MSW management scenarios that you want to compare. The shaded areas indicate where you need to enter information.

1. Describe the baseline generation and management for the MSW materials listed below. If the material is not generated in your community or you do not want to analyze it, leave it blank or enter 0. Make sure that the total quantity generated equals the total quantity managed.

Material	Tons Generated	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted
Newspaper	100		100		NA
Office Paper	50		50		NA
Corrugated Boxes	20		20		NA
Mixed Paper (general)					NA
Mixed Paper (primarily residential)					NA
Mixed Paper (primarily from offices)					NA
Aluminum Cans					NA
Steel Cans					NA
Glass	50		50		NA
HDPE					NA
LDPE					NA
PET					NA
Food Waste					
Yard Waste					
Grass					
Branches					
Leaves					

Please enter data in short tons (1 short ton = 2,000 lbs.)

2. Describe the alternative management scenario for the MSW materials generated in the baseline. Any decrease in generation should be entered in the Source Reduction column. Any increase in generation should be entered in the Source Reduction column as a negative value. (Make sure that the total quantity generated equals the total quantity managed.)

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Research:

Tools -- WARM

WAste Reduction Model (WARM) -- Results

Total GHG Emissions from Baseline MSW Generation and Management (MTCE):	5
Total GHG Emissions from Alternative MSW Generation and Management (MTCE):	(145)
Incremental GHG Emissions (MTCE):	(150)

MTCE = metric tons of carbon equivalent

Per Ton Estimates of GHG Emissions for Alternative Management Scenarios

Material	GHG Emissions per Ton of Material Source Reduced (MTCE)	GHG Emissions per Ton of Material Recycled (MTCE)	GHG Emissions per Ton of Material Landfilled (MTCE)	GHG Emissions per Ton of Material Combusted (MTCE)	GHG Emissions per Ton of Material Composted (MTCE)
Newspaper	(0.91)	(0.86)	(0.23)	(0.22)	NA
Office Paper	(1.03)	(0.82)	0.53	(0.19)	NA
Corrugated Boxes	(0.78)	(0.70)	0.04	(0.19)	NA
Mixed Paper, Broad	NA	(0.67)	0.06	(0.19)	NA
Mixed Paper, Resid.	NA	(0.67)	0.03	(0.19)	NA
Mixed Paper, Office	NA	(0.84)	0.10	(0.18)	NA
Aluminum Cans	(2.98)	(3.88)	0.01	0.03	NA
Steel Cans	(0.84)	(0.57)	0.01	0.02	NA
Glass	(0.14)	(0.08)	0.01	0.02	NA
HDPE	(0.61)	(0.37)	0.01	0.21	NA
LDPE	(0.89)	(0.49)	0.01	0.21	NA
PET	(0.98)	(0.62)	0.01	0.24	NA
Food Waste	NA	NA	0.15	(0.05)	0.00
Yard Waste	NA	NA	(0.11)	(0.07)	0.00
Grass	NA	NA	(0.01)	(0.07)	0.00
Leaves	NA	NA	(0.30)	(0.07)	0.00
Branches	NA	NA	(0.12)	(0.07)	0.00

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EPA/OSW Program Activities

- WasteWise
- Pay-As-You-Throw
- Climate Grants

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Program Activities:

WasteWise

- Voluntary partnership program with over 800 partners, expanded to include local and state govts
- Goals: waste prevention, buy/manufacture recycled products, and recyclables collection
- Report progress annually

EPA WASTE WISE
Preserving Resources, Preventing Waste

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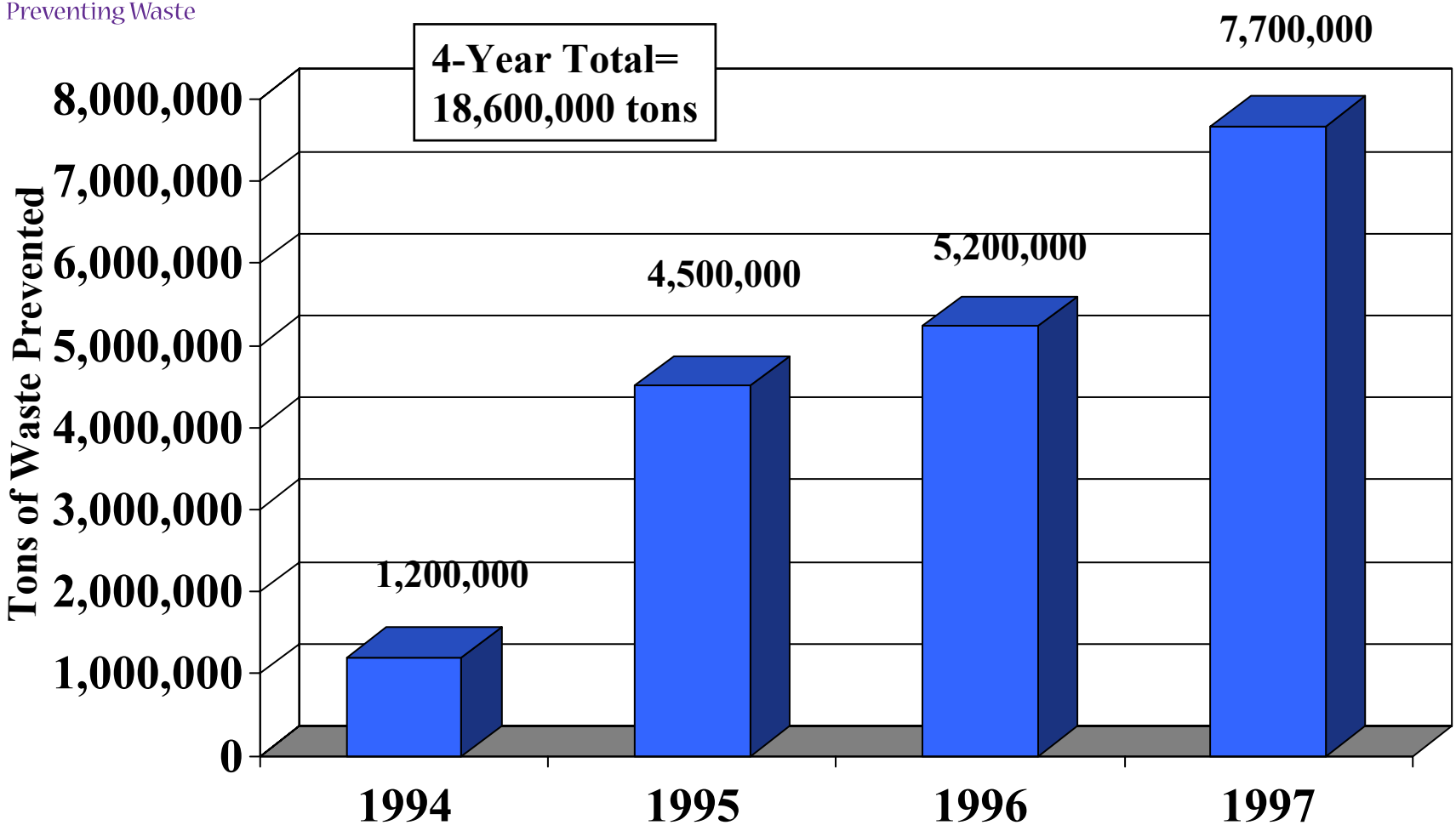
Preserving Resources, Preventing Waste

Program Activities:

WasteWise Achievements



Waste reduction achievements refer to waste prevention and recycling results.

Program Activities:
WasteWi$e GHG Results

- 1997 results:
  - 6.8 million tons waste recycled;
  - 816,000 tons reduced
- GHG reduction: 5.0 million MTCE

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Program Activities:
Pay-As-You-Throw Program

- Economic incentive program for reducing waste
- The more you throw away, the more you pay
- Provide tools, technical assistance, and grants

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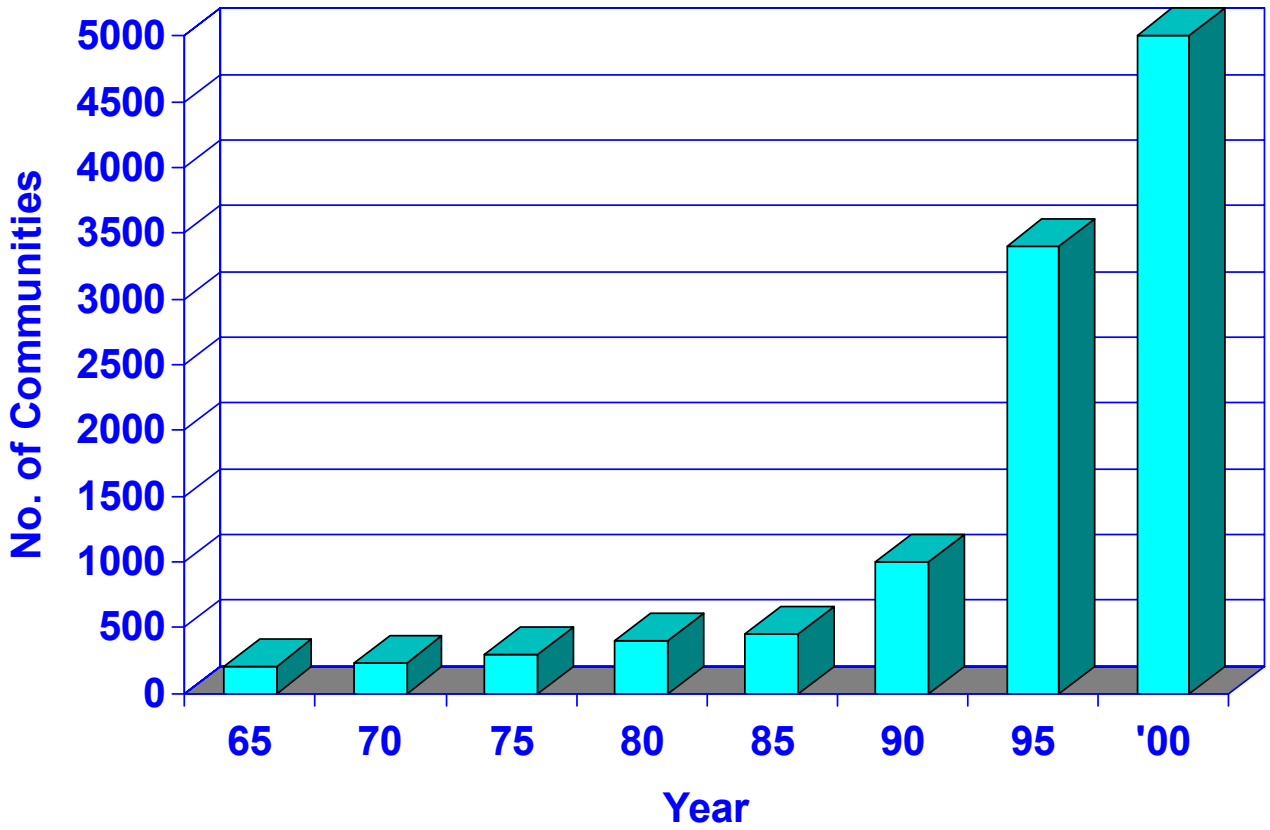
Program Activities:
Growth in PAYT Programs



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Program Activities:
Pay-As-You-Throw Program

- Average decrease in waste disposal: 14-27%
- Recycling rates can double or triple in some communities
- If 200 new communities were to implement PAYT programs, could yield 3.8 million MTCE in GHG reductions

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Program Activities:
Innovative Waste Reduction Projects

- Support states and local governments
- Implement innovative waste reduction activities
- 30+ efforts ongoing in 25 States

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For Additional Info

- Website: **www.epa.gov/mswclimate**
- For inquiries on technical assistance to waste managers:

Eugene Lee,
USEPA OSW Climate Coordinator
ph 703-308-7270
Email: LEE.EUGENE@epamail.epa.gov, OR

Henry Ferland
USEPA OSW
ph 703-308-7269

Email: FERLAND.HENRY@epamail.epa.gov

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